18 May 2001

Grand Prairie Region, AR
Review of the Main Points of the McKenzie Plan

The Grand Prairie Area Demonstration Project was released for public review in 1998 and has completed all technical and environmental reviews. The Record of Decision was executed in February 2000. An engineering review was conducted to verify the need for an import system and the use of the White River as the water source. The Governor of Arkansas' Water Resources Task Force created an oversight committee to participate in the review. This committee included the Director of the Field Office of the Nature Conservancy, the USFWS, the USGS, the Arkansas State Geologist, as well as the irrigation districts and project opponents. The committee participated in the formulation and evaluation of means to supply the project with water. The Director of the Arkansas Field Office of the Nature Conservancy, the USFWS, the USGS, the Arkansas State Geologist all voted to support the recommendation of the review including implementation of the authorized project. The full Governor's Task Force including the Arkansas Game and Fish Commission endorsed the oversight committee recommendations to support project implementation and the Governor accepted them. The Governor subsequently wrote the Memphis District urging the rapid implementation of the project.

The project will enable continuing irrigated agriculture on the Grand Prairie to protect both the Alluvial and Sparta Aquifers, to initiate restoration of native prairie species, and to provide a significant increase in the waterfowl habitat on the prairie. Detailed analyses of the project indicate that the project will not harm the White River, will not effect the extent and duration of the river flooding, will not effect the river's wetlands, and will not decrease the waterfowl habitat provided in the river bottoms. The project will enable continued irrigated agriculture without sacrificing the environment.

If the project is not constructed, the alluvial aquifer will be depleted. The Sparta Aquifer will be depleted jeopardizing the source for drinking water in the area. Water will only be available to continue irrigated agriculture on 23% of the currently irrigated cropland with annual losses of $46 Million. This will effect all segments of the regional economy including not only agribusiness and processing such as Riceland and Producers Rice Mills but will effect retail sales and the tax base.

The plan recently released by Mr. Don McKenzie unfairly criticizes the Grand Prairie Area Demonstration Project. Mr. McKenzie makes the following points:

Mr. McKenzie claims the project will not protect the alluvial aquifer. **In fact, the project will not only protect the alluvial aquifer but will also protect the Sparta aquifer, the source of drinking water for the area.** The project uses no water from the Sparta aquifer. It is much more expensive than the imported water. The import system and use of the alluvial aquifer at the safe yield will provide for 87% of the average annual water needs. The safe yield used for the project was a very conservative number to allow for aquifer recharge. Even if all of the unmet water needs to fully irrigate the area is drawn from the alluvial aquifer, the aquifer recharge will exceed aquifer withdrawals. This was pointed out at a meeting held on May 15, 2001, by aquifer experts from the National Water Center. Members of the USFWS, the USGS, AGFC, NRCS, ASWCC, the Agricultural Extension Service, and the ASWCC staff were present. A detailed sheet on aquifer protection is attached.

Mr. McKenzie claims that the project will not meet the irrigation water needs of the area. **The fact is that the project will provide the water needed to continue irrigated agriculture on Grand Prairie.** No claims were made that the project would supply 100% of the demand. Without the project, annual losses in agricultural production would be $46 Million. The project will enable production to continue at a sustainable rate. The project analyses accounted for not providing 100% of the demand or providing

for the complete goal of flooded rice fields. The project still has a benefit to cost ratio of 1.24 and provided over 12.4 Million additional duck use days. Even if all of the unmet demand is met from the alluvial aquifer and 100% of the area was fully irrigated, recharge of the aquifer would exceed withdrawals. The pump cut off levels cannot be altered without complying with the National Environmental Policy Act. This would include supplementing the EIS.

Mr. McKenzie claims that the project does not adequately increase conservation. **The fact is that the project increases conservation to the maximum practical amount.** At a meeting on May 15, 2001, irrigation efficiency experts for the Agricultural Extension Service, who participated at the request of the USFWS, claimed that 80% efficiency was not possible over the entire project area. Mr. McKenzie offers no proof of his claim that "Affordable technology is available to increase average irrigation efficiency to 80%." Experts in agricultural irrigation disagree saying that 70% was the appropriate level for planning.

Mr. McKenzie claims that the waterfowl benefits for the project are not needed and that the project would risk damage to fisheries in the White River. **The facts are that the waterfowl plan was developed by others including current members of the Arkansas Game and Fish Commission staff and Ducks Unlimited and that extensive fisheries studies conducted by recognized experts found no significnat impacts to the fisheries in the river**. The plan expressed a need for 45,000 acres. The project will provide 38,000 on an average annual basis with an increase in 12.4 Million duck use days. Recent studies by Ducks Unlimited not associated with the Grand Prairie project show that flooded and rolled rice fields increase invertebrate production which provides a valuable source of protein that aids waterfowl health for their return migration and nesting. The bottom line is that the project will not lessen the availability of natural waterfowl foods or fisheries habitat. This increase provided by the project is all positive.

Mr. McKenzie claims that the project will not be of benefit for the native prairies. **The project will provide an increase of approximately 5 times the acreage of remaining natural prairie.** The Corps had studies conducted that established that the prairie grasses in the Grand Prairie are a unique geno-type. This project will help preserve that unique geno-type. The prairie will be located in strips like the Arkansas Natural Heritage Commission's railroad prairie and will be established with seeds harvested from that prairie. The prairie grasses located in strips provide wildlife value for many species. Seeds were harvested and prairie grass plots are being established in conjunction with the University of Arkansas at Pine Bluff's Lonoke farm and under the supervision of staff of the Arkansas Natural Heritage Commission. These plots will enable the propagation of the native geno-types.

Mr. McKenzie's plan presents no back up data to support its claims or its costs.

Mr. McKenzie's plan calls for an increase in irrigation efficiency to 80%. At a meeting on May 15, 2001, irrigation efficiency experts for the Agricultural Extension Service who participated at the request of the USFWS claimed that 80% efficiency was not possible over the entire project area.

Mr. McKenzie's plan calls for maximizing on-farm storage. Mr. McKenzie claims discrepancies in the General Reevaluation Report that simply do not exist. He confuses an 8-foot depth used for future without project conditions to account for likely improvements without a project with the existing conditions average depth of five and one-half feet. The estimate of the number of reservoir acres that could be used without an import system was computed by a water balance taking into account the average runoff per month and the ability to catch this runoff. Mr. McKenzie simply claims that "Conservationist believe the estimate is very conservative and that, by capitalizing on the abundant surface water available during the winter, additional reservoirs could be functional." It appears that no

analyses beyond the belief of conservationists went into this calculation. On the practical side, this winter was the first winter in 3 years that the existing reservoirs could be filled with rainwater. The project as authorized will more than double the amount of recoverable storage.

Mr. McKenzie says that the remainder of cropland should be converted to less water intensive uses. By his figures, this would result in approximately 150,000 acres of currently irrigated cropland being removed from production by WRP or CRP. Analyses indicate that a higher figure would be required. Mr. McKenzie appears to have estimated the cost of removing the land at $50,000,000. Mr. MeKenzie gives a cost comparison of his plan verses the Grand Prairie project. Using his figures he would maintain irrigated agriculture on 95,000 acres for $158 Million. Mr. McKenzie's cost estimate is rather vague and unsupported. He is comparing his number to figures in the GRR that are fully funded accounting for inflation over the life of the project and include the costs already sunk into the studies of nearly $20 Million. Without any project, water would be available in the future to irrigate 55,000 acres. With the Grand Prairie project, water would be available to fully irrigate 212,000 acres, an increase of 157,000 acres. Using Mr. McKenzie's unsupported figures, his plan would fully irrigate only 40,000 acres over the without project conditions for an investment of $158 Million. Analyses indicate that benefits Mr. McKenzie claims are not attainable and he provides no documentation for his estimate of costs.

Mr. Mckenzie's other claims on page 22 are simply not true. He either has a total lack of understanding or is trying to mislead in his assertions that "large chunks of the project area have been carved out." The project area has not been reduced. The 362,000-acre study area was established to include studies in the White River wetlands. The 241,777 acres of irrigated cropland is not from an unofficial source. It is presented in the General Reevaluation Report. The 247,556 acres are the existing acreage subject to irrigation presented in the environmental appendix. This number does not include the fish pond acres because it was not appropriate for the environmental analyses. The 241,777 acres is the number of acres that was used in the calculation of future economic outputs. This represents 247,556 existing irrigated acres, minus 8,849 acres to be converted to storage reservoir, but include 3,070 acres of fishponds. Again, Mr. McKenzie's statement that the project area was changed after the ROD was executed is totally incorrect, but small adjustments in the project area would not change the economic justificationof the project, the project purpose, or project accomplishments or significantly affect the environmental analyses of the project anyway.

Mr. McKenzie's claim that the Corps erred in computing reservoir storage is also false. The section on page 31 is referring to the development of future with and without project demand and supply data. As stated, the assumption is that in the future without project conditions existing reservoirs will have an average depth of 8 feet. This accounts for any reservoir rehabilitation and improvement to existing reservoirs that would take place in the future without the Grand Prairie Area Demonstration Project. The other section refers to existing conditions.

The annual recharge and safe yield are presented in the same section of the report. The initial page 23 reference describes how safe yield was calculated. This ran the ground water model until the future without project conditions. In model cells with less than 20-feet of saturated thickness, no water was assumed to be withdrawn because a well cannot be developed with that little saturated thickness remaining. In cells that had greater saturated thickness, the safe yield from the model was reduced proportionately to the irrigated agricultural land in the cell assuming wells would only be developed on agricultural lands. This is stated in the report. The report also states that this is a conservative "safe yield" number to allow for recharge of the aquifer as long as the aquifer is not completely depleted. Mr. McKenzie's claim that this number could be substantially higher conflicts with his claim that the project will not protect the aquifer.

Mr. McKenzie has searched the report trying to identify errors. The report has been released for years. No significant errors have been identified by anyone including the Oversight Committee for the Governor's Water Resources Task Force.

Mr. McKenzie concludes that the White River would be damaged by the Grand Prairie project. Studies indicate that the project would not have significant impacts to the White River. The project was planned with pump cutoff levels that would provide for the needs of the river first including water quality, fish and wildlife, and navigation. Mr. David Carruth also stated during meetings of the Oversight committee that he did not believe that the Grand Prairie project would hurt the White River. The Grand Prairie project will provide for continued and sustained irrigated agriculture, protect the aquifers, protect the economy, and will not harm the environment.

Questions Received from Mr. McKenzie and Our Response

The following were questions received from Mr. McKenzie. In the process of responding, the Corps received two additional sets of questions from the National Wildlife Federation.

Question 1. The project as proposed in the Corps' General Reevaluation Report (GRR), as evaluated in the Final Environmental Impact Statement, and as approved by the Record of Decision (hereafter, "proposed project") contains a project area of 362,662 acres, of which 247,556 acres are irrigated cropland. However, the White River Irrigation District--in order to get the 50% +1 signatures legally needed to move forward at the state level--reduced the project area (after the ROD was signed) by carving off and eliminating from the project substantial geographic areas that harbored pockets of landowner opposition. The end result, according to several unofficial sources I've seen, was a "final" project area of about 241,000 acres. To my knowledge, no complete assessment of this most current project area has ever been made public. My question: How many acres of irrigated cropland are present in this most current, modified, total project area of about 241,000 acres?

Response. Your statement that the irrigation district reduced the project area by carving off pockets of opposition is totally incorrect. The tax roles initially used for petition preparation had areas marked as agricultural land including timberland and pastureland. As land that was not irrigated was identified, the irrigation district removed it from their database. Prior to district formation, an assessor will analyze the land benefited by the project and a court will act on the district formation issue.

The 241,000 acres of irrigated cropland is not from an unofficial source. It is presented in the General Reevaluation Report. The 247,556 acres is the number of cleared acres subject to irrigation presented in the environmental appendix. This number does not include the fish pond acres because it was not appropriate for the environmental analyses. The 241,000 is the number of acres that was used in the calculation of future economic outputs. This number also included the fish ponds, though they will not receive water from the distribution system. The 241,000 includes placing reservoirs on 8,800 acres of currently irrigated cropland taking it out of production. Again, your statement that the project area was changed after the ROD was executed is totally incorrect, but small adjustments in the project area would not change the economic justification or significantly effect the environmental analyses for the project anyway.

Question 2. The proposed project would increase average irrigation efficiency from the current 60% level to 70%, based on benefit: cost or some other optimization analyses. If a project objective were to maximize irrigation efficiency (disregarding cost, for the time being), how high could the average

irrigation efficiency be elevated across the project area by employing a comprehensive suite of state-of-the-art irrigation technologies?

Response. One of the project objectives was to maximize irrigation efficiency. The NRCS, the experts at this type of work, performed the analyses and optimization of the on-farm features. Based on their extensive experience and prior research, the NRCS concluded that 70% was the highest average efficiency that could reasonably be obtained in the Grand Prairie.

Question 3. The GRR states that, if no supplemental water distribution system were built, the watersheds within the project area could support a maximum of only 1,379 acres of new on-farm irrigation storage reservoirs, in addition to the 15,556 acres of currently existing on-farm irrigation storage reservoirs. How was such a precise estimate derived? Is it actually a "maximum" or is it an "optimum" acreage of potential new reservoirs? What is the margin of error for this estimate; i.e., what degree of confidence does the Corps have in this estimate? Such a precise estimate implies that a thorough watershed analysis was conducted, and that there must be a map in a Corps office somewhere with circles and numbers indicating the exact locations where new irrigation storage reservoirs of certain sizes are justifiable. Please provide me a copy of such a map, if it exists.

Response. A water balance was developed to account for rainfall, runoff, evaporation, and other functions. As stated in the GRR, without an import system with increases in storage above the 1,379 acres on an average annual basis, the same amount of water would be distributed over a greater surface area of reservoirs leading to increased evaporation and less water available for the crops. Based on water availability without an import system, additional water will not be available due to additional storage.

A scenario was also analyzed where, with an import system, storage was increased by 25% over the 88,000 acre-feet of new storage. The 88,000 acres was verified to be the optimum with an import system.

Question 4. Regarding existing on-farm irrigation storage reservoirs: Page 31 of the GRR's Main Report states that the volume of the existing storage was determined by multiplying the surface acreage (15,556 acres) by an average depth of 8 feet. If this average depth is correct, 15,556 acres X 8 feet = 124,448 acre-feet of existing storage volume. However, page 68 of the Main Report states that existing reservoirs have a storage capacity of 84,525 acre-feet, of which only 73,188 acre-feet is available for use. If the total volume estimate is accurate, the average depth of existing storage would be only 5.43 feet. Could you please explain this apparent discrepancy in average depth and total volume of existing storage? Which average depth and storage volume is correct? If 5.43 feet is the correct average depth, is it technically feasible to upgrade the existing storage reservoirs (by raising levees or lowering bottoms) to an average 8' depth?

Response. There is no discrepancy. The section on page 31 is referring to the development of future with and without project demand and supply data. As stated, the assumption is that in the future without project conditions existing reservoirs will have an average depth of 8 feet. This accounts for any reservoir rehabilitation and improvement to existing reservoirs that would take place in the future without the Grand Prairie Area Demonstration Project.

For with project conditions, the assumption made in the report was that land would go out of production and be converted into storage. This was a conservative assumption from an economic standpoint and actually minimized the project benefits and maximized impacts. However, increases in capability of existing reservoirs are being included in eligible features in the farm plans. The requirement for project success is that 88,000 additional acre-feet of storage are constructed.

Question 5. The Record of Decision displayed a simple table of pump shut-off flows (cfs) by month. Could you please provide the Clarendon gauge readings that correspond to each of these monthly flows?

Response. This information is available in the project pamphlets previously provided based on the current rule curve for the gage.

I'm sure as soon as I send this I will think of more questions that I had meant to ask, but I greatly appreciate your attention to and assistance with these questions.

Below are additional questions that Mr. McKenzie sent for an answer.

Question 1. What documentation do we have concerning the viability of the project?

a. Financial viability of the project.

Response. We have completed a general reevaluation report and Environmental Impact Statement (EIS) for the project. The report and analyses included in the report underwent technical review by the Mississippi River Commission staff. The draft report and EIS were released for public review in August 1998. The final report and EIS were released in December 1999 for public review. The Record of Decision on the EIS was executed in February 2000. The report contains the complete economic analyses of the project with a benefit to cost ratio based on national benefits of 1.24 to 1.

The State of Arkansas acting through the Arkansas Soil and Water Conservation Commission is the project sponsor and is fully capable, both financially and legally, of sponsoring the project. The commission has executed the financially binding Project Cooperation Agreement with the Government to construct the project and has agreed to operate and maintain the project after construction at no cost to the Government. The commission is contributing over $9 Million in cash to the project this fiscal year.

Question 1.b. Will project protect the aquifer?

Response. Yes. The project will protect both the Sparta Aquifer and the Mississippi Valley Alluvial Aquifer in the project area. The Sparta Aquifer is a deeper confined aquifer with pure water that serves as the drinking water source for the project area. As the alluvial aquifer is depleted, farmers are turning to the Sparta though it is expensive to develop wells and pump water from those depths. The project uses no water from the Sparta to meet the needs of the area.

The alluvial aquifer is the source for over 80% of the irrigation water being used in the Grand Prairie. By 2015, it will no longer be a viable source for irrigation. The project would continue to use water from the alluvial at the "safe yield" of the aquifer. The safe yield was computed by examining each cell in the aquifer model, determining the safe yield of that individual cell under future conditions (no water was withdrawn from cells with a saturated thickness of less than 20 feet because a well could not be developed with only 20 feet of saturated thickness remaining), and accessing the water only under the irrigated cropland. This estimate was considered to be a conservative value and would allow for recharge over a long period of time. This would provide for approximately 7% of the need in the project area. The safe yield value used was 35,600 acre-feet. Currently, the demand for ground water is over 400,000 acre-feet per year. The current recharge is estimated to be between 100,000 and 130,000 acre-feet per year. The project has an unmet demand of 59,800 acre-feet per year meaning some of the area would not be in production or some of the crops would not be fully irrigated on an average annual basis. Even if the all of the unmet demand was met through the alluvial aquifer, recharge would exceed

withdrawals.

The project will protect both the alluvial and Sparta aquifers in the area. Without the project, both the alluvial aquifer and Sparta aquifer, the source for drinking water, will be depleted with losses of $46 Million annually to the national economy and disastrous consequences to the local, agricultural based economy.

Question. 2. Basically, will enough farms be enrolled in the project so that the benefits cited for the projects are actually obtained (reference 1.a. and 1.b.?

Response. Yes. A sensitivity analyses was conducted on the project area. Just over 60% of the irrigated area would have to participate for the project to remain economically justified. Currently, it is estimated that farm management plans have been requested for over 83% of the irrigated acreage in the project area with additional farm plans being requested as the project moves forward. Additional storage in these plans could not be filled without use of an import system.

Question 3. Can the state force farmers to enroll in the project?

Response. No. However, farm management plans have been requested over approximately 83% of the irrigated acreage in the project area with additional farm water management plans being requested as the project moves forward.

Question 4. Can the state force farmers to reduce their pumping of water from the aquifer?

Response. Yes. The Arkansas Soil and Water Conservation Commission has responsibility and authority for protecting the state's ground water resources. Both the alluvial and Sparta aquifers in the project area have been declared critical. This is the first step to state regulation of ground water pumping. However, Mr. Randy Young, Director of the Commission, has stated that he believes regulation will not be necessary if the project is implemented.

Question 5. What is the status of the study of alternative sources of water for the project?

Response. The study has been completed and submitted to HQUSACE for review. The Governor of Arkansas' Water Resources Task Force created an oversight committee to participate in the review. This committee included the Director of the Field Office of the Nature Conservancy, the USFWS, the USGS, the Arkansas State Geologist, as well as the irrigation district and project opponents. The committee participated in the formulation and evaluation of means to supply the project with water. The Director of the Arkansas Field Office of the Nature Conservancy, the USFWS, the USGS, the Arkansas State Geologist all voted to support the recommendation of the review including implementation of the authorized project. The full Governor's Task Force including the Arkansas Game and Fish Commission endorsed the oversight committee recommendations to support project implementation and the Governor accepted them. The Governor subsequently wrote the Memphis District urging the rapid implementation of the project.

Question 6. Has the Corps looked at an alternative project proposed by "project opponents"?

Response. Yes. All alternatives proposed by project opponents have been examined and considered. The latest proposal has not been formally presented to the Corps but has been considered. Attached is a copy of a response to the "plan" as provided to the Grand Prairie on-farm environmental team. The stated purpose of the plan was to raise a reasonable doubt in the minds of Congress. The plan simply

will not work and has no technical basis. The response also rebuts the ability to achieve 80% irrigation efficiency over the project area. According to the experts in irrigation, 80% efficiency is not achievable over the project area for the life of the project. Even if it were achievable, without a source of import water, water would not be available for 70% of the area currently in irrigated agriculture. Without any project, water would not be available for 77% of the area currently in irrigated agriculture. Without an import system, the increase in efficiency would not solve the problems or protect the aquifers.

Our Response to Mr. Dave Smith's Article

Recently, a paper was provided to the Grand Prairie On-Farm Environmental Team. This paper included an alternative to the Grand Prairie Area Demonstration Project called the Grand Prairie Alternative (GPA). It stated that this proposal was presented at a joint meeting of the Arkansas Chapters of the Wildlife Society and American Fisheries Society on February 7, 2001. They also included a mobilization strategy as quoted below.

> "Given that the crucial Congressional Appropriations cycle is rapidly approaching, there may be insufficient time to become immersed in a GPA feasibility analysis that strives for a 100% level of certainty. Rather, it might be more important to quickly join forces with agricultural opponents of the GPADP with a moderately well researched GPA and attempt to cast a reasonable doubt over Congress' consideration of the $319 Million GPADP appropriation. This potentially could fir in with the new administration's desire to reduce government spending. It also might be a good idea to develop the GPA behind the scenes and seek an influential local farmer – or group of producers – to take credit for the proposal and sell it to others in the community, particularly if they have any links to the Governor's Water Task Force."

This GPA proposal claimed to be able to develop surface water supplies sufficient to irrigate 75% (180,000 acres) of the cropland in the Grand Prairie project area by increasing irrigation efficiency to 80% and increasing storage. The proposal also said that the farmers would be paid to retire that land unable to be irrigated and get paid for the land converted to reservoirs.

The information presented in this proposal was considered by the Corps and the National Resources Conservation Service (NRCS). Studies conducted by the NRCS and others have indicated that getting 80% irrigation efficiency over a large area is just not possible. Getting 80% on an individual farm may be possible, but it is not possible over a large area. Even with 80% efficiency and additional storage, irrigated agriculture could not be continued on 180,000 acres. Analyses indicate that with an increase to 80% efficiency but without a source of additional water, water would be available for only 72,900 acres. Approximately 18,300 additional acres could be irrigated over the 54,600 in the future without project conditions. This means that even with an increase to 80% efficiency, water would not be available to continue irrigation on 70% of the land currently irrigated with disastrous effects to the regional and national economy.

From a practical standpoint, this winter (2001) is the first time in the last 3 years that many farmers have reported being able to fill their existing reservoirs. The Grand Prairie Area Demonstration Project will more than double the recoverable storage in the project area filling these reservoirs first from rainfall. Studies have been conduced on the amount of rainfall that could be captured. Increasing reservoirs without a source of water to fill them in most years will spread the existing water over more surface acres and increase evaporation.

The majority of the Grand Prairie is not wetlands, it was a prairie. It is not likely the land

payments program proposed would ever be funded to such an extend over such a relatively limited area when the WRP program is targeted to wetlands.

The paper implies that the Grand Prairie will not save the aquifers. Two freshwater aquifers underlay the Grand Prairie, the Mississippi Valley Alluvial Aquifer and the Sparta Aquifer. As the alluvial is depleted, irrigators are turning to the Sparta which also furnishes the drinking water and water for industry. This resource does not have the water carrying or recharge capacity of the alluvial and will be depleted by agricultural use. It also is more susceptible to permanent compaction and salt water intrusion from the salt-water aquifers located underneath as its water level and water pressure drops. The Grand Prairie Area Demonstration Project does not use any water from the Sparta aquifer for irrigation. The water from the Sparta is also much more expensive. The project would still use the alluvial aquifer at its long-term safe yield, the water that could be pumped after the aquifer is essentially depleted. This number is significantly less than the current recharge rate for the project. The project has a water shortfall on an average annual basis, but even if the shortfall is met from the alluvial aquifer, its current recharge rate is greater than the safe yield plus the unmet need. This assumes that the project is built before the aquifer is depleted.

The stated purpose of this proposal is to "cast a reasonable doubt" over the Congressional appropriation for the Grand Prairie Area Demonstration Project. The paper stated that a feasibility level study will not be done. Even if the people developing it were serious about implementation and a means was found to implement it, this GPA proposal would not realize the benefits claimed. The Grand Prairie Area Demonstration Project has had years of serious study and has just completed a review of the water sources for the project. Environmental agencies were involved in the studies, and all environmental reviews have been completed for compliance with the National Environmental Policy Act. Studies have indicated that no significant impacts to the White River would occur. The project was planned allocating water to the needs of fish and wildlife, water quality, and navigation before any water diversion would occur. The project will protect both the Sparta and Mississippi Valley Alluvial Aquifers and will provide the water necessary to continue irrigated agriculture in the Grand Prairie.

The debate on 70% vs 80% average irrigation efficiency for the Grand Prairie Project.

Irrigation Efficiency is the ratio of the average depth of irrigation water beneficially used to the average depth applied, expressed as a percentage.

While the concept of Irrigation Efficiency seems simple and straight forward, the actual application of this term to field practice is very complicated and difficult to understand. Irrigation Efficiency is directly related to a myriad of variables which must be considered when deciding when and how much to irrigate. Some of the factors influencing irrigation efficiency include field slope, field size, soil type, soil texture, slope variability, paddy size, furrow length, flow rate, water source availability (timing), water source amount, infiltration rates, deep percolation rates, rainfall, evaporation rates, temperature, existing soil moisture, available water holding capacity of the soil, traffic pans, irrigation application methods, and probably most important of all, management practices.

From "Design and Operation of Farm Irrigation Systems" an ASAE Monograph Number 3 in a series published by American Society of Agricultural Engineers, September 1983

"One of the most important terms that is used extensively by irrigation specialists in designing and operating irrigation projects is irrigation efficiency. However, the same term is not well understood by many policy makers and others **only casually acquainted with irrigated agriculture.**" ...

"Undoubtedly, many irrigated projects could reduce the net consumption of water by substantial improvements in the distribution and on-farm systems, but the savings in water generally will not be proportional to the changes in irrigation efficiency as is often erroneously assumed. This is a very common misconception that is expressed by the general public when evaluating or considering the use of water for crop production."

An interagency task force report (ITFR, 1979) indicated that "If all measures in the Soil Conservation Service survey were implemented under a 25-yr accelerated program, it is estimated that conveyance efficiency could be increased 10 percent, and on-farm efficiencies 13 percent."

NRCS has estimated an average 10% improvement in on-farm irrigation efficiencies as a result of installing conservation practices in the Grand Prairie Project Area.

From "United States Department of Agriculture, Soil Conservation Service, National Engineering Handbook, Section 15, Irrigation, Chapter 4, Border Irrigation"

Success in designing an irrigation system depends on the ability of the designer to make a reasonable estimate of the efficiency that can be achieved on a particular site under a given set of management conditions. In most cases, the principal hazard is overestimating efficiency, which leads to designing an irrigation system which cannot achieve adequate irrigation at the efficiency that can actually be obtained. "In all irrigation methods, efficiency is affected more by the **management practices** of the irrigator than by any other factor."

"On gently sloping well-leveled fields, if adequate facilities for the control and distribution of water are installed **and good irrigation management practices are followed**, a field efficiency of 60 to 75 percent usually is feasible."

Table 4-12 lists "Suggested design efficiency for graded border irrigation by slope and intake family." The values range from 50% to 80% with 15 instances of 80% recommended as a "field design" efficiency out of approximately 350 instances listed in the table.

It should be noted that contour levee irrigation is a modified form of border irrigation and is slightly less efficient due in large part to the varying sizes of the "paddies".

From "United States Department of Agriculture, Natural Resources Conservation Service, National Engineering Handbook, Part 652, Irrigation Guide"

Section 652.0904(b) Irrigation efficiency definitions

"Irrigation efficiencies are a measure of how well an irrigation system works as well as the **level of management** of the system."

(7) Potential or design application efficiencies

"Potential or design application efficiencies are usually those recommended in the irrigation guide and in various tables and charts in NEH, Part 623, (Section 15) Irrigation. These efficiencies are typically used for designing irrigation systems. The efficiency recommendations usually assume **good management** and maintenance of a well designed and installed system." ... "Judgement by the designer is required. Overestimating the operators level of management can result in an inadequate irrigation system design."

SUMMARY

On February 7, 2001, a paper entitled "A Central Valley of California Perspective on the Grand Prairie Area Demonstration Project and Ideas that Could be Incorporated into a Grand Prairie Alternative" was presented at a TWS meeting by Mr. Dave Smith. In this paper Mr. Smith touts the need to "achieve 80% irrigation efficiency".

The credentials in the field of irrigation of these individuals making these claims are not presented. The NRCS employees utilized to assist in the planning, design, and development of the Grand Prairie Area Demonstration Project plan are experts in the fields of irrigation and/or engineering. Those making the claims appear to be "**only casually acquainted with irrigated agriculture**" as stated in paragraph 1 above and have little if any knowledge related to the requirements to meet an average of "80% irrigation efficiency" for the entire project area. However, documentation of information for public and NRCS review would be considered.

The NRCS agrees that we should "strive to attain greater than 80% efficiency". However, to claim that an average 80% irrigation efficiency can be accomplished over the entire project area would be irresponsible and would likely bring questions about the economic viability of the project if the economic analysis were based on this figure.

In order to achieve an 80% average irrigation efficiency on a **single** field, an 80% average irrigation efficiency must be accomplished for every irrigation event (as many as 6 per year for soybeans), for every year, for the life of the project (50 years). Projected to the farm level, every field must maintain this average for every year, for the life of the project. Projected to the project level, every farm must maintain this average for every year, for the life of the project.

Anyone with experience in handling more than a single task at a time, will realize this is a very admiral goal, but not likely to be achieved.

NRCS has utilized an abundance of information, data, studies, expertise, experience and professional judgement in order to develop the on-farm portion of the Grand Prairie Area Demonstration Project plan. We stand by this information as our best estimate of achievable results and will gladly review this information with anyone willing to spend the time necessary to understand the processes utilized in the development of this plan.